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Measuring the impact of economic diversification on sustainable development in Algeria during the period (1990-2023).

قياس أثر التنوع الاقتصادي علي التنمية المستدامة في الجزائر خلال الفترة (1990-2023)

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Abstract: This research aims to highlight the importance of economic diversification in Algeria as a strategic option for achieving sustainable development in light of fluctuations in oil prices and the decrease in oil revenues, and this is based on the standard method through the use of the co-integration methodology and the error correction model. This is to verify the existence of an effect in the long and short term of the independent variable, which is the volume of exports outside of fuel, as an indicator that measures economic diversification, on the dependent variable, which is the per capita GDP, as an indicator that measures sustainable development in Algeria during the period (1990-2023).The study concluded that economic diversification did not reach the desired take-off, as its contribution represented 35.21% It is weak in relation to per capita GDP.

Keywords: Economic diversification; sustainable development; Volume of exports outside of fuel; per capita GDP; cointegration.

Résumé :

L'objectif de cette étude est de montrer l'importance de la diversification économique en Algérie, en tant qu' un choix stratégique pour le développement économique durable, et en se basant sur la méthode économétrique, et en utilisant la méthode de la cointégration et le modèle a correction d'erreur pour vérifier l'existence de l'impact de la variable exogène représentée par le volume des exportations hors hydrocarbures en tant qu'indice qui mesure la diversification économique sur la variable endogène représentée par le produit intérieur brut par habitant en tant qu'indice qui mesure le développement durable en Algérie pendant la période (1990-2023), et l'étude a conclu que la diversification n'a pas atteint ses objectifs, car sa contribution au développement économique durable reste toujours faible, elle est de 35.21%.

Mots-clés : Diversification économique ; développement durable ; volume des exportations hors hydrocarbures ; produit intérieur brut par habitant ; cointégration.

ملخص:

تهدف هذه الدراسة البحثية إلى إبراز أهمية التنويع الاقتصادي في الجزائر باعتباره خيارا استراتيجيا لتحقيق التنمية المستدامة في ظل تقلبات أسعار البترول، و نقص مداخيل النفط، و هذا بالاعتماد على الأسلوب القياسي من خلال استعمال منهجية التكامل المشترك ونموذج تصحيح الخطأ، و ذلك للتحقق من وجود تأثير في المدبين الطويل و القصير للمتغير المستقل و المتمثل في حجم الصادرات خارج المحروقات باعتباره مؤشرا يقيس التنوع الاقتصادي على المتغير التابع و المتمثل في نصيب الفرد من الناتج المحلي الإجمالي باعتباره مؤشرا يقيس التنمية المستدامة في الجزائر خلال الفترة (1990-2023) ، و توصلت الدراسة إلى أن التنويع الاقتصادي لم يصل إلى الإقلاع المنشود، كون مساهمته تمثل 35.21% وهي ضعيفة بالنسبة لنصيب الفرد من الناتج المحلي الإجمالي.

الكلمات المفتاحية:

التنويع الاقتصادي؛ التنمية المستدامة؛ الصادرات خارج المحروقات؛ نصيب الفرد من الناتج المحلي الإجمالي؛ التكامل المشترك؛ نموذج تصحيح الخطأ.

I- Introduction :

Algeria, like other oil-producing countries, depends on this resource in its economy, as it is a depleted resource on the one hand, and its revenues depend on demand in global markets that have fluctuations in prices, which leads to instability in the flow of these wills, to reflect negatively on government spending, and thus economic activities in general are affected. This makes it necessary to find alternative sources of income. Therefore, since the oil crisis in 1986, it has adopted a set of economic measures and policies with the aim of getting out of dependence on the hydrocarbons sector, and making the Algerian economy more diversified to confront the decline in global oil prices, by encouraging the agricultural, tourism and industrial sectors through tax facilities and incentives, as well as by offering support to young people who aspire to invest and start small and medium-sized enterprises.

In light of the above, we decided to raise the following problem:

To what extent does economic diversification contribute to sustainable development in Algeria during the period (1990-2023)?

To answer this question, we used the descriptive and analytical approach on the theoretical side, as the study included shedding light on the theoretical concepts of economic diversification and sustainable development, and the experimental approach based on the co-integration methodology to show the relationship between the independent variable represented by the indicator that measures economic diversification, which is the volume of exports outside of fuel, and the dependent variable, which is represented by the crude gross product index, which is considered an indicator for measuring economic development, based on an estimate of the relationship between economic diversification and sustainable development in the long term, to highlight the impact of economic diversification shocks on sustainable development in Algeria for the period extending from 1990 to 2020.We used annual data The data related to the variables associated with the study was collected and processed statistically to reach the answer to the previous problem. Based on EViews version 12 program.

We therefore divided the research into three themes:

1- General concepts about economic diversification.

2- Sustainable development.

3- A econometric study about the impact of economic diversification on sustainable economic development in Algeria during the period (1990-2023).

1- Concepts about economic diversification:

The concept of economic diversification, following the recent emergence of several crises, has been circulating among decision makers ,this is to confront oil shocks, especially for countries that depend on this resource in their economy.

1.1- Definition of economic diversification:

Economic diversification is defined as the process of diversifying sources of income,

expanding the productive base, and increasing the contribution of productive sectors to the gross domestic product, in a way that rids the economy of the dangers of relying on the dominance of a single substance (Azouz, 2018, page 18)
It is also defined as the process of exploiting all local resources and production capacities to ensure the achievement of accumulation of internal capabilities capable of generating renewable resources, reaching the stage of local production dominating the internal market, and in successive stages diversifying exports (Grove, 2016, page 638).
From here we can define economic diversification as the process of diversifying sources of national income through restructuring the economy and raising the level of contribution of different economic sectors to income.

1.2- Forms of economic diversification:

Economic diversification is divided into the following types (Rawabiyah, 2016, page 3)

1.2.1- Vertical diversification:

It is using the outputs of one activity to be the inputs of another activity.

1.2.2- Horizontal diversification:

It is creating new opportunities for new products.

1.2.3- Lateral diversification:

It is an entry into a new field of activity through the production of new products that are unrelated to current products and target new markets.

1.2.4- Comprehensive diversification:

It is through which we seek productive institutions to expand their current product assortment while at the same time acquiring and penetrating new markets.

1.2. 5- Geographical diversification:

Which means entering new geographical areas and adapting to changes in the new production environment.

1.2.6 Financial diversification:

It is diversification that aims to reduce investment risks by distributing capital to a variety of investment activities, which cannot be lost at the same time.

1.3- Determinants of economic diversification:

Economic diversification depends on several factors, as follows:

1.3.1- Natural resources:

It is considered one of the most important determinants of economic diversification, as it can be used to raise exported productive goods. However, the well-being of the society is not determined by the number of resources available, but rather by the exemplary exploitation of these resources (Tawfiq,2011, page 03).

1.3.2- Institutional capacity and human resources:

It helps enhance capabilities and diversification capabilities, as the latter is considered an important factor in distributing income and eliminating disparities of education and others (Rawabiyah, 2016, page 135)

1.3.3- Private sector:

The private sector has an important role in economic diversification, in managing innovations and economic activity in 2011, but it faces a number of obstacles, which requires the state to find

ways to enhance the spirit of initiative and remove bureaucratic obstacles facing private companies (Tawfiq, 2011, page 163).

1.3.4- Governance:

It is the activity carried out by management, which relates to decisions that set expectations, grant authority, or verify performance, and consists either of a separate process, or of a specific part of management processes, as the availability of good governance helps increase economic diversification (Tawfiq, 2011, page 164).

2- Sustainable development:

Sustainable development is about meeting human needs and aspirations and involves recognizing human potential and managing the environment and its resources for human well-being. Sustainable development is considered the focus of linking the present and the future, as activating its dimensions results in improving the performance of various fields.

Sustainable development can be defined as a process that improves human life economically and socially, taking into account the preservation and rational exploitation of natural resources.

2.1- Sustainable development goals:

Sustainable development has many goals, all of which revolve around raising the standard of living of the population, providing them with the means for a decent life, and preserving the share of future generations of natural resources. People in different regions do not view development as an end in itself, but rather view it as a means to achieve other goals. The means must always serve the goals and objectives and not the other way around, therefore, the sustainable development goals can be summarized as follows (Akram Laour, 2020, page 227):

- Taking care of human development

- Job creation;

- Spreading environmental awareness in society and its sense of responsibility towards it, and urging them to participate effectively in decision-making in preparing, implementing and following up on sustainable development programs and projects;

- Achieving rational exploitation of natural resources, by reducing levels of consumption of energy and natural resources;

- Raising the standard of living.

2.3- Dimensions of sustainable development:

Sustainable development includes multiple and overlapping dimensions, which are represented by four interacting dimensions: the economic dimension, the social dimension, and the environmental dimension (Zawya, 2019, page 12).

2.3.1- The economic dimension:

The economic dimension of sustainable development revolves around processes of improvement and change in production patterns, the use of clean energies, the introduction of improved technologies, and the sustainable management of natural resources.

2.3.2 - The environmental dimension:

The environmental dimension is based on taking into account environmental boundaries so that every ecosystem has boundaries

Certain levels of consumption and depletion cannot be exceeded. If these limits are exceeded, deterioration of the ecosystem occurs. (Masturi, 2014, page 23).

2.3.3 - The social dimension:

This dimension refers to the relationship between nature and humans and to the advancement of community well-being and respect for human rights, effective participation in decision-making, improved health and education services and security, and social equality (Zawya, 2019, p.14).

2.4- The role of economic diversification in sustainable development:

From the perspective of sustainable development, economic diversification is considered a guarantee of long-term economic stability, as it is the process of expanding the scope of economic activities through the production and distribution of services. Economic diversification has an important role in sustainable development, as it contributes to:

- Achieving many advantages by reducing dependence on a single resource to finance the state's public expenditures, because when the performance of the national economy is linked to a single resource (oil), any decrease in the price of the latter will lead to many risks in the productive structure (Al-Rida, 2016, p.3).

- Reducing the risk of declining exports for countries that depend on a single supplier. When the prices of exported products decrease, foreign exchange returns decrease, which leads to a reduction in the country's ability to finance sustainable development (Al-Khatib, 2014, p.08)

- Promoting economic integration between sectors by strengthening the links between economic sectors, thereby achieving economic stability.

- Increasing the value added in the different sectors of the national economy and thus speeding up the process of economic growth (Satisfaction, 2016, page 4).

- Absorbing the labor force and increasing its productivity, in contrast to the oil extraction sector, which depends on oil. Absorbing the labor force and increasing its productivity, in contrast to the oil extraction sector, which depends on large capital investments, and depends only on a limited number of workers, which often come from abroad, and therefore economic diversification has an important role in:

-Providing job opportunities and reducing unemployment (Al-Khatib, 2014, page 09);

- Providing food security;

-Supporting the resilience of the country's economy to external shocks from oil price fluctuations;

-Stimulating and developing the private sector;

-Expanding the environment's ability to meet people's needs through improved technology, social organization, and diversified employment opportunities (Zawia, 2019, page65) .

3- An econometric analysis of the impact of economic diversification on sustainable development in Algeria during the period (1990-2023):

Through this econometric study, we will try to determine the extent to which the volume of exports outside of fuel in Algeria affects the gross domestic product as an indicator of sustainable economic development in light of the fluctuations in fuel incomes during the period extending from 1990 to 2023, and therefore we will use annual data covering the period, which was obtained from various official sources, represented by the National Bureau of Statistics and the National Council for Information and Statistics.

The data under study in a set of time series represent the volume of exports outside hydrocarbons, as an indicator that measures economic diversification, and the per capita GDP as an indicator of sustainable development.

In this study, we prefer to introduce the Natural logarithm function to the series on the volume of exports outside hydrocarbons, which becomes Ln(XHH), and to the series on per capita GDP, which becomes Ln(GDPC).

3.1 Stationary study of time series of study variables:

Through this standard study, we will try to determine the extent to which the volume of non-fuel exports in Algeria affects the gross domestic product as a development indicator. To study the stability of time series of variables in the volume of non-fuel exports and per capita GDP, we use the expanded Dickey-Fuller test (Bourbonnais, 2015, p. 276), and the results obtained are listed in the following table (01):

table (01): The results of the stationarity of the series.

Variable/ Tests	At level					
ADF	None		intercept		Trend and intercept	
	t_{cal}	t_{tab}	t_{cal}	t_{tab}	t_{cal}	t_{tab}
LnXHH	-0.40	-1.96	2.37	-1.96	-4.30	-3.56
LnGDPC	6.74	-1.96	0.70	-1.96	-6.74	-3.56
Variable/ Tests	First difference					
	None		Intercept		trend and intercept	
	t_{cal}	t_{tab}	t_{cal}	t_{tab}	t_{tcal}	t_{tab}
DLnXHH	-6.54	-1.96	-5.53	-1.96	-7.30	-3.56
DLnGDPC	-1.97	--1.96	-3.75	-1.96	-3.94	-3.56

Source: Eviews 12 output

In light of the results shown in Table (1) above, it appears that the time series for the per capita GDP series (LnGDPC) is not stationary in level but stationary at first-order differences (DnLGDPC), as well as the time series for the volume of exports outside fuels. (LnXHH) is not stationary in level but stationary in the first difference and has become (DLnXHH).

3.2 - Test of causality between variables:

To determine the direction of the causal relationship between per capita GDP and exports outside of hydrocarbons, we will test Granger for the causal relationship, and using the Eviews12 program we arrived at the results presented in the following table. (02):

Table (02): Causality test results for: Granger between DLnGDPC and DLnXHH

Pairwise Granger Causality Tests			
Null Hypothesis	Obs	F-Statistic	**Prob**
LnGDPC does not granger cause LnXHH	**32**	**5.0445**	**0.0061**
LnXHH does not granger cause LnGDPC	**32**	0.4510	0.7704

Source: Eviews 12 program outputs.

We conclude from this that there is a causal relationship between the per capita GDP and exports outside of fuel at a significant level of 5% in one direction, which is that the per capita GDP is directed towards exports outside of fuel, meaning that the per capita GDP causes exports outside of fuel

3.3 - Co-integration test:

After studying the stationarity of the variables, which proved that they are not stationary at the level, but rather integrated to the first degree, hence the condition of studying cointegration is available where we use the Engel-Granger methodology.

3.3.1- The first step:

It includes estimating the co-integration regression through the long-term relationship between the two variables, per capita GDP and exports outside of fuel, using the ordinary least squares method, as shown by the following relationship:

From the results obtained we conclude the following relationship:

$$LnPIBH = 23.18763 + 0.352161\ LnXHH$$

tc (143.2036) (14.60213)

proba (0.0000) (0.0000)

$$R^2 = 0.876656\ , \qquad \bar{R}^2 = 0.872544\ , \quad F_c = 213.2221$$

The model parameters have statistical significance, and this is what the Student statistic shows us (the probability is less than 5%).In addition, the model is acceptable as a whole because Fisher's calculated value is greater than the value tabulated for it.

The value of the coefficient of determination was 87.66%, meaning that exports outside hydrocarbons explain 87.66% of the per capita GDP and the rest is explained by other variables outside the model.

3.3.2- The second step:

Extracting the series of residuals resulting from the regression equation, which we explain through the following equation:

$$\epsilon_t = LnPIBH_t - 23.18763 - 0.352161\ LNXHH_t$$

After conducting a stationarity study of the residual series, we obtained the following results:

Table (03): Results obtained based on the ADF test for the residual series

Variable/ Tests	At level					
ADF	Without trend and constant		With constant		With trend and constant	
	t_{cal}	t_{tab}	t_{cal}	t_{tab}	t_{cal}	t_{tab}
ϵ_t	4.06	-1.96	-0.17	-1.96	-5.56	-3.56

Source: Eviews 12 outputs

The results indicate that the series of residuals is stationary at the level with a level of significance of 5%, from which we can say that there is co-integration between the variables of the study, which reflects the existence of a long-term equilibrium relationship.

3.3.3- Error correction model:

The existence of a long-term equilibrium relationship, conduct us to apply the error correction model to check the presence of the short-term equilibrium relationship between the economic diversification and sustainable development. The results are showed in table (03):

Table (03): Results obtained based on the ECM

Variables	Coefficient	t-stast	Prob
DLnXHH	22.98152	13.67392	0.000
EC(-1)	-0.13847	4.84537	**0.0034**

Source: EViews 12 outputs

The ECM results show that the error correction term is negative and statistically significant at the 5% level. This confirms that the essential conditions for applying the ECM are satisfied. It also indicates the presence of the short-term equilibrium relationship between economic diversification and sustainable development, gradually adjusted towards long-term equilibrium. Specifically, 13.85% of any deviation from equilibrium is corrected in each period, suggesting that economic diversification positively influences sustainable development.

3.4- Test the validity of the model:

In order to ensure the validity and validity of the model, we must ensure that it is free of standard problems and does not conflict with economic theory. Accordingly, we will conduct an economic and statistical evaluation of the estimated model (Saleh, 1999, page 193).

3.3.1.1 - Autocorrelation test for residuals:

The test results are represented in the following Table (04):

Table (04): LM test results

Null Hypothesis: no serial correlation at lag order h		
F-STATISTIC	LM-test	Proba
	1.84	0.15
Obs*R-squared	LM-test	Proba
	7.08	0.13

Source: Eviws 12 outputs.

We note from the table above that we thus accept the null hypothesis that the errors are not autocorrelated.

3.2.1.2-Testing the problem of heterogeneity of error variation:

The test results are represented in the following Table (05):

Table (05) White test results.

F-statistic	Obs*R-squared	Prob
0.24	0.53	0.78

Source: Eviews 12 Outputs

We note from the above table that, hence, the decision is to accept the null hypothesis, i.e.the stability of the error term variation.

From the previous tests it can be stated that the estimated cointegration model is of good statistical quality and reliable for the analysis.

Therefore, an increase of 1% in exports outside of fuel will lead to an increase in per capita GDP by 35.21%. This is consistent with the Algerian economy, as Algeria depends on petroleum revenues, and the state must work to encourage sectors that can contribute to economic diversification.

IV- Conclusion:

In this research, we were exposed to familiarity with the theoretical and applied aspects of the subject of study. On the theoretical side, we tried to address general concepts about economic diversification and its determinants, as well as highlighting the role that economic diversification plays in sustainable development. Subsequently, an econometric approach is employed to assess the extent to which economic diversification influences sustainable development sustainable by using the per capita GDP index, which we considered an indicator that measures sustainable development The volume of exports outside hydrocarbons is an indicator that measures economic diversification.

Study results:

- We must not rely on a single resource whose price is dependent on international prices, which creates risks from it, leading to failure in financing sustainable development

- Economic diversification is considered a strategic option to confront the shocks of oil price fluctuations

- From the econometric study, it can be concluded that the estimated cointegration method and the error correction model are of good statistical quality and can be relied upon for the analysis.

- The econometric study indicated that there is a correlation linking the volume of exports outside hydrocarbons with the per capita GDP index.

Suggestions:

In light of the results obtained, Algeria can achieve a level of economic diversification that enables it to avoid oil price fluctuations. It contributes positively to the process of sustainable development. It is necessary to work with the following strategies:

-Paying attention to the agricultural sector as it is one of the most important sectors that can be relied upon to achieve self-sufficiency, and export abroad, given the capabilities Algeria possesses agricultural assets, including fertile lands and a favorable climate;

- Encouraging more medium and small industries;

- Paying attention to the tourism sector;

- Paying attention to the services sector;

- To take an interest in the private sector.

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